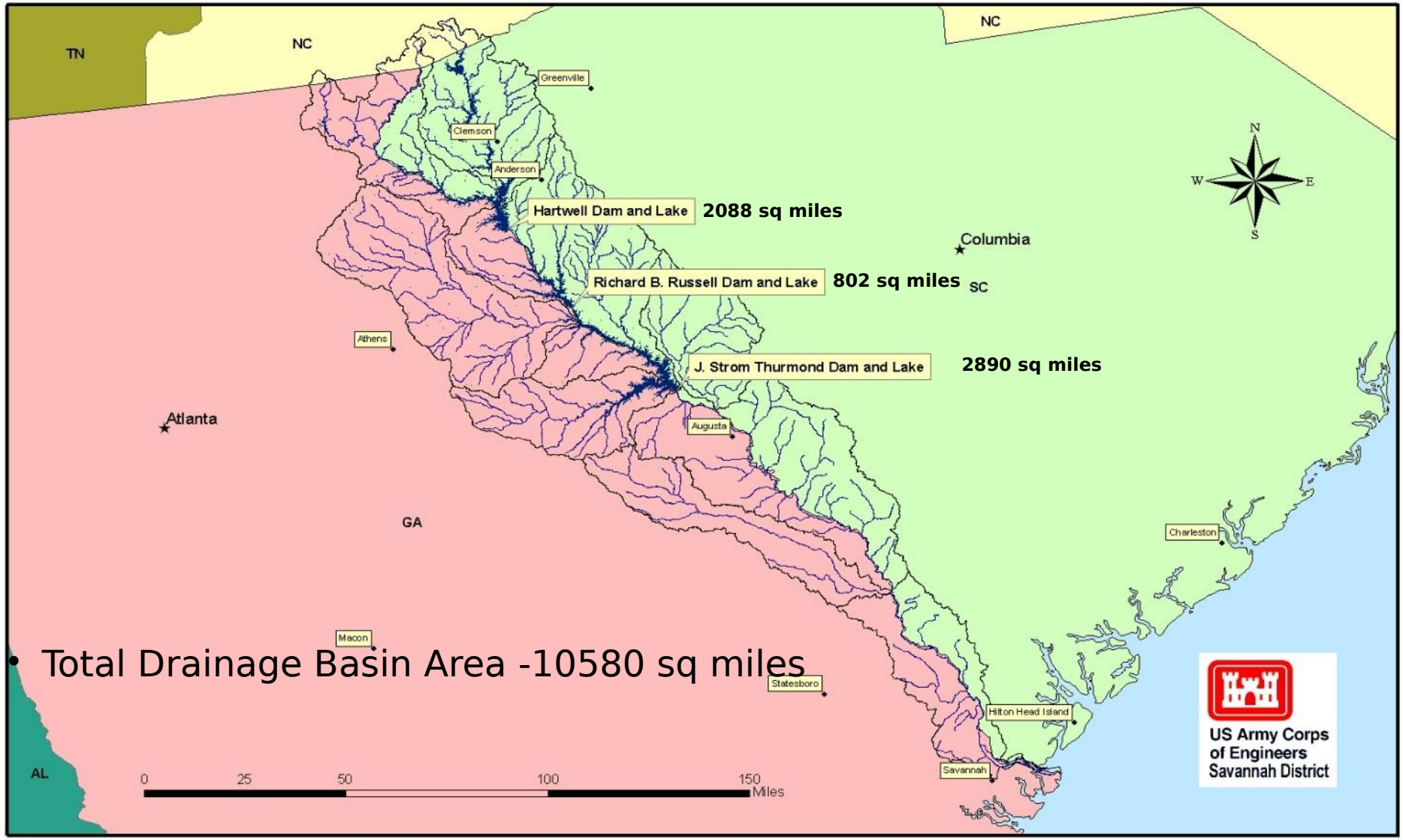
Savannah River Basin Drought Workshop

October 24-25, 2012

US Army Corps of Engineers

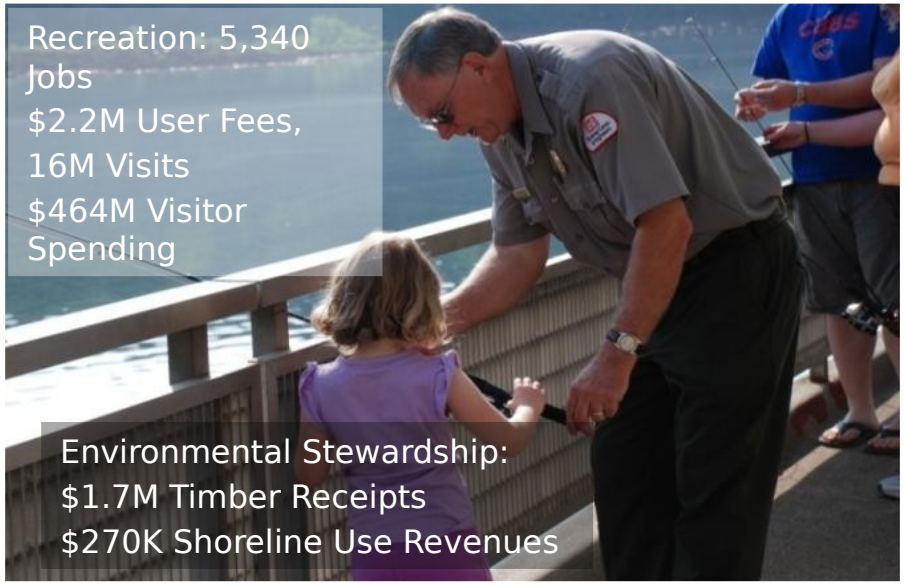
BUILDING STRONG®

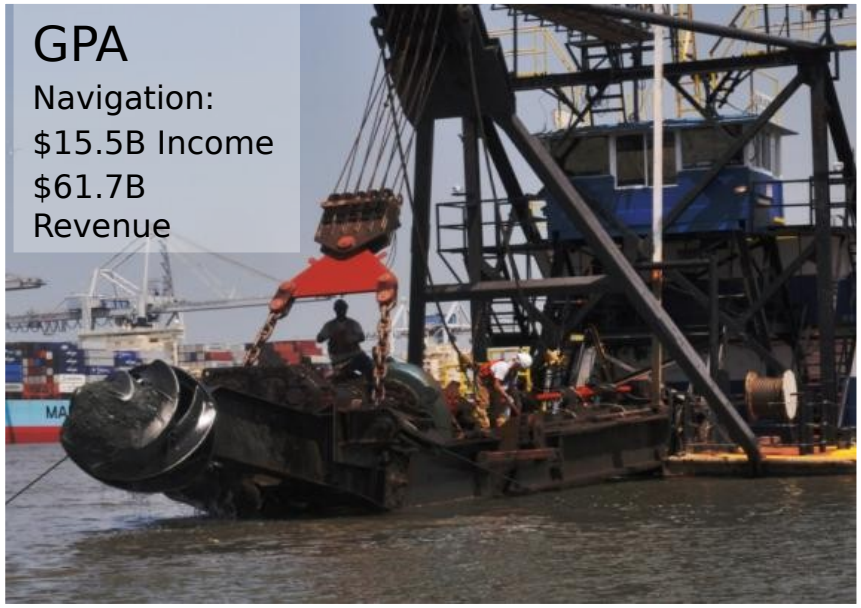
The Savannah River Basin



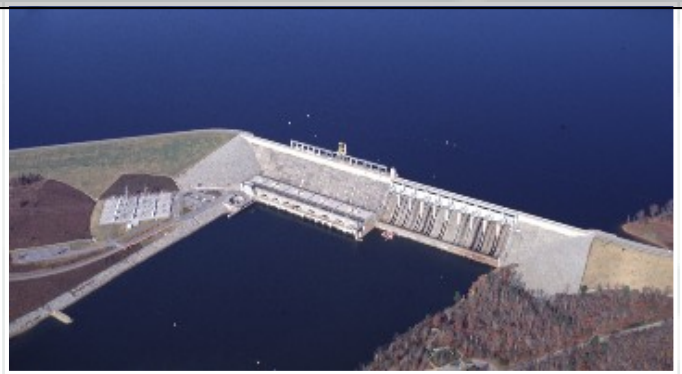
- Total Drainage Basin Area -10580 sq miles

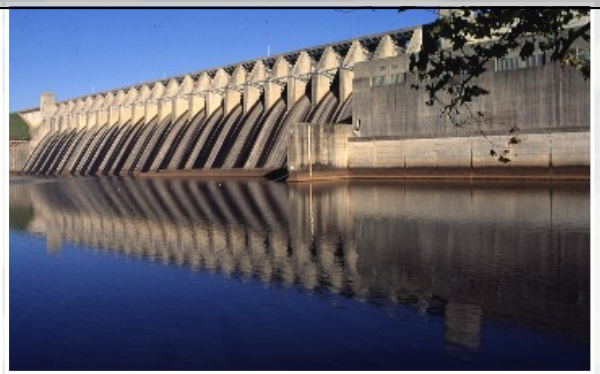
Savannah River Basin Value to the Nation





Hartwell	Russell	Thurmond
3rd most-visited Corps project in the Nation - 10.1M visitors/year	**Largest Corps power plant east of Mississippi River**	**8th most-visited Corps project in the Nation-6M visitors/year**
Completed in 1962	Completed in 1984	Completed in 1952
56,000 acres (660 ft), 962-mile shoreline	26,653 acres (475 ft), 540-mile shoreline	71,100 acres (330 ft), 1200-mile shoreline
5 turbines , 422 MW	8 turbines, (4 as pump-back) 648 MW	7 turbines, 364 MW
85 Recreation areas (50 Corps operated)	32 Recreation areas (3 Corps operated)	55 Recreation areas (35 Corps operated)
Largest shoreline management program in the Corps		

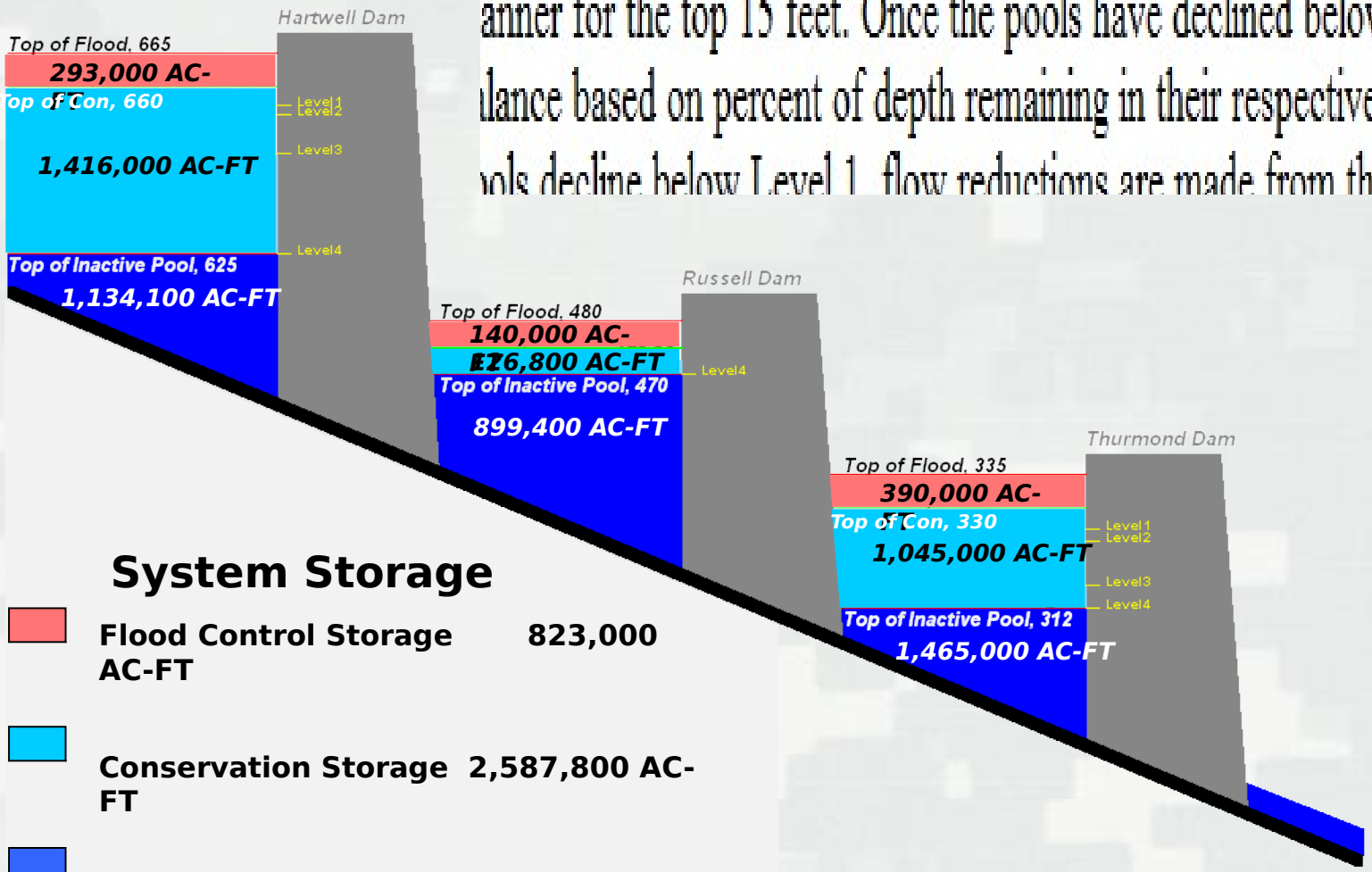




Congressional Authorization

Authorized Purpose	Congressional Authorization		
	Hartwell	Russell	Thurmond
Flood Damage Reduction	Flood Control Act of 1950	Flood Control Act of 1966	Flood Control Act of 1944
Hydropower			
Navigation		No Navigation Authorization	
Water Supply	Water Supply Act of 1958		
Water Quality	Federal Water Pollution Control Act of 1972		
Fish and Wildlife	Federal Water Project Recreation Act of 1965	Federal Water Project Recreation Act of 1965, WRDA 1986	WRDA 1986
Recreation		Federal Water Project Recreation Act of 1965	

Savannah River Reservoir System
Pool Schematic



anner for the top 15 feet. Once the pools have declined below this point, they

lance based on percent of depth remaining in their respective conservation pools. I

ols decline below Level 1 flow reductions are made from the system in accordanc

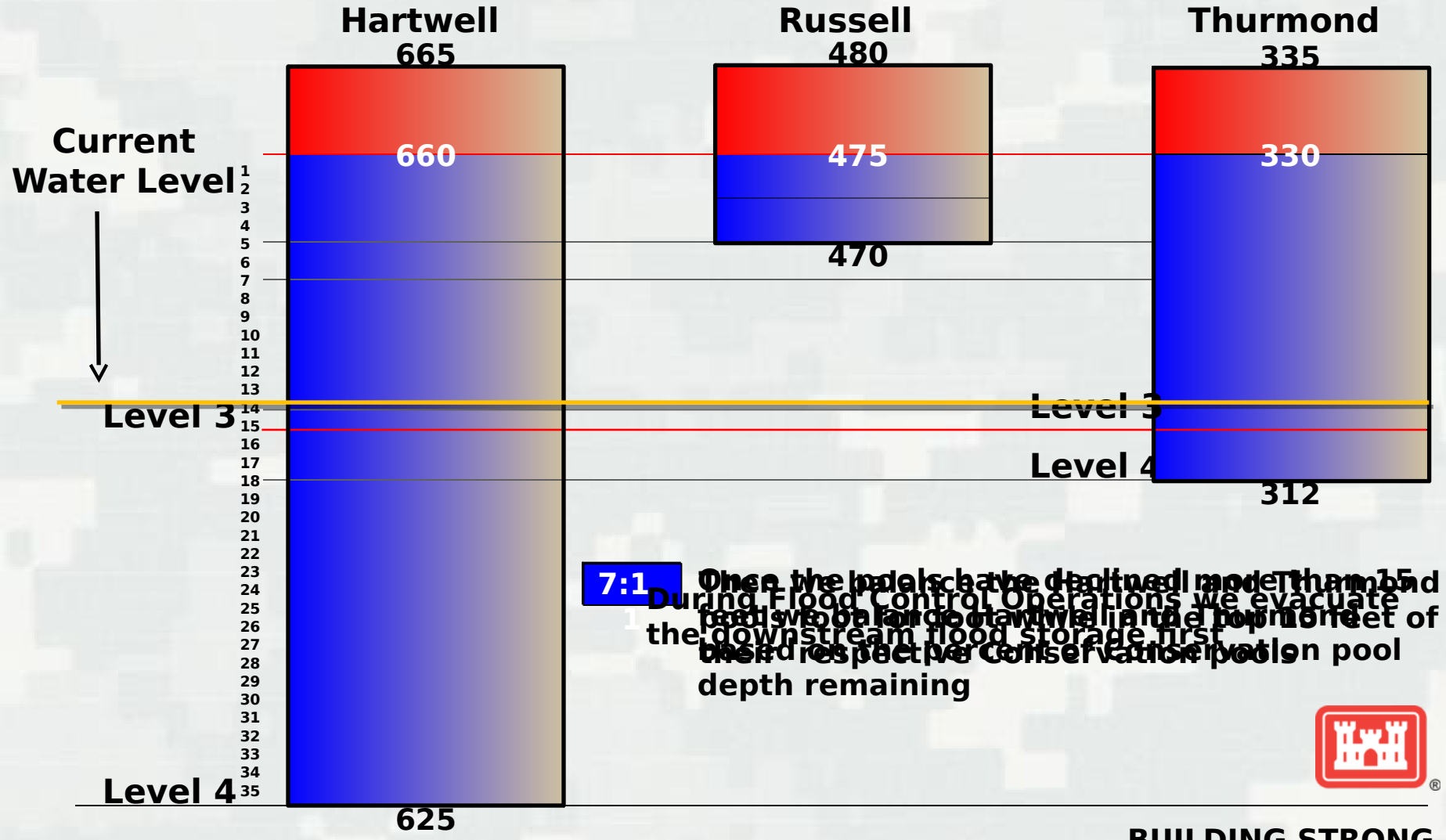
System Storage

Flood Control Storage **823,000 AC-FT**

Conservation Storage **2,587,800 AC-FT**

Inactive Storage **3,498,500 AC-FT**

Pool Balancing Procedure



7:1

During Flood Control Operations we evacuate the downstream flood storage first based on the percent of conservation pool depth remaining

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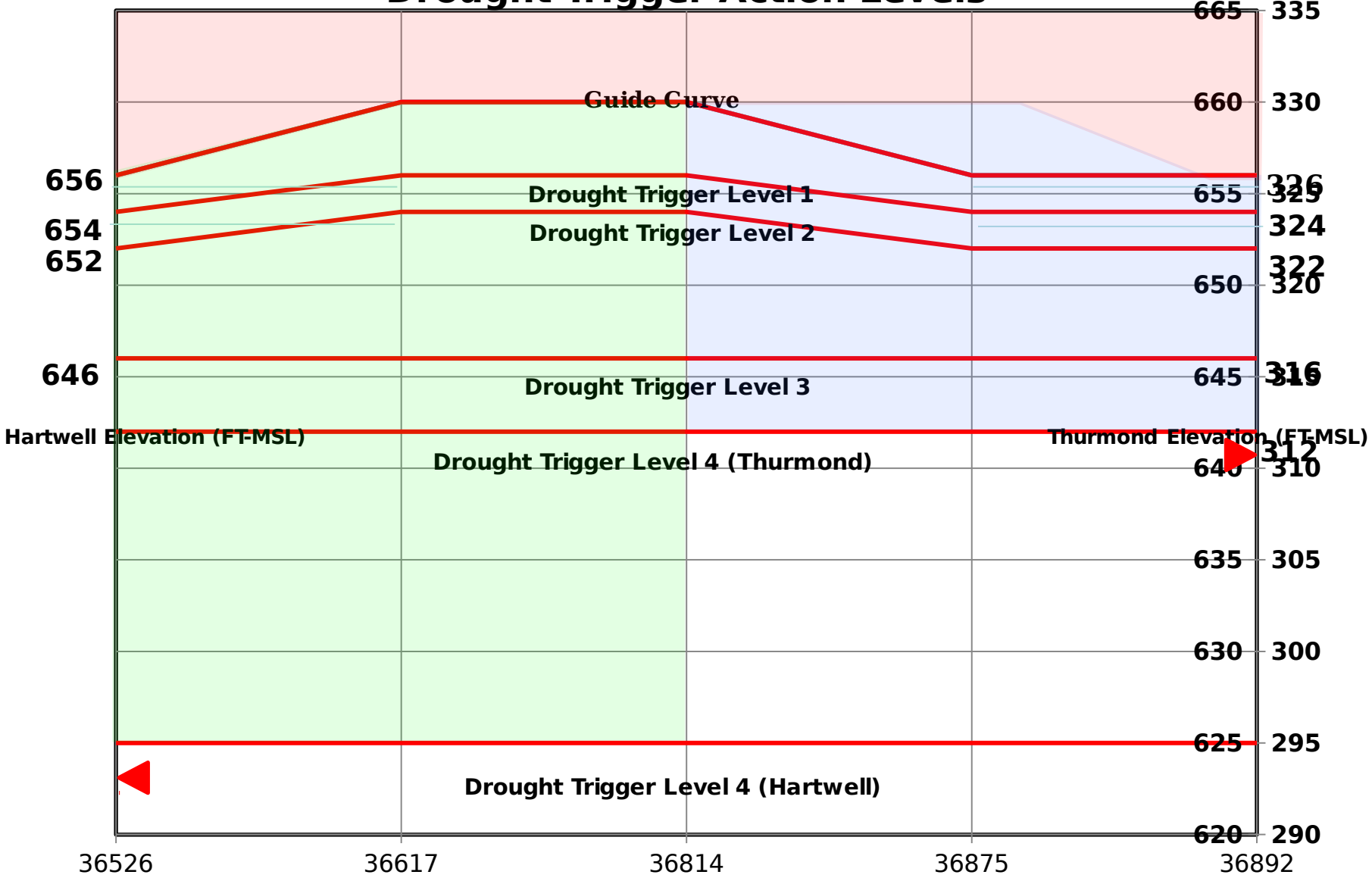
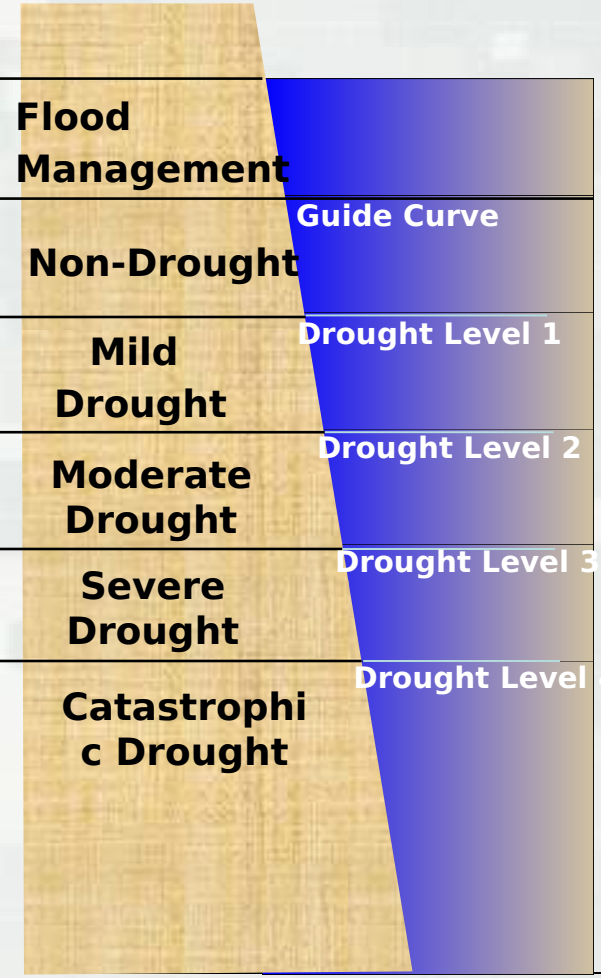
Drought Trigger Action Levels



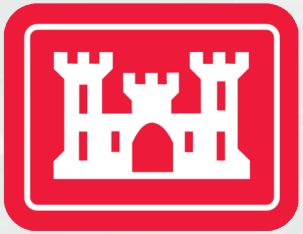
Balanced Flood Control Purposes



Flood Risk Management
Navigation
Hydropower
Recreation
Fish and Wildlife
Water Quality
Water Supply

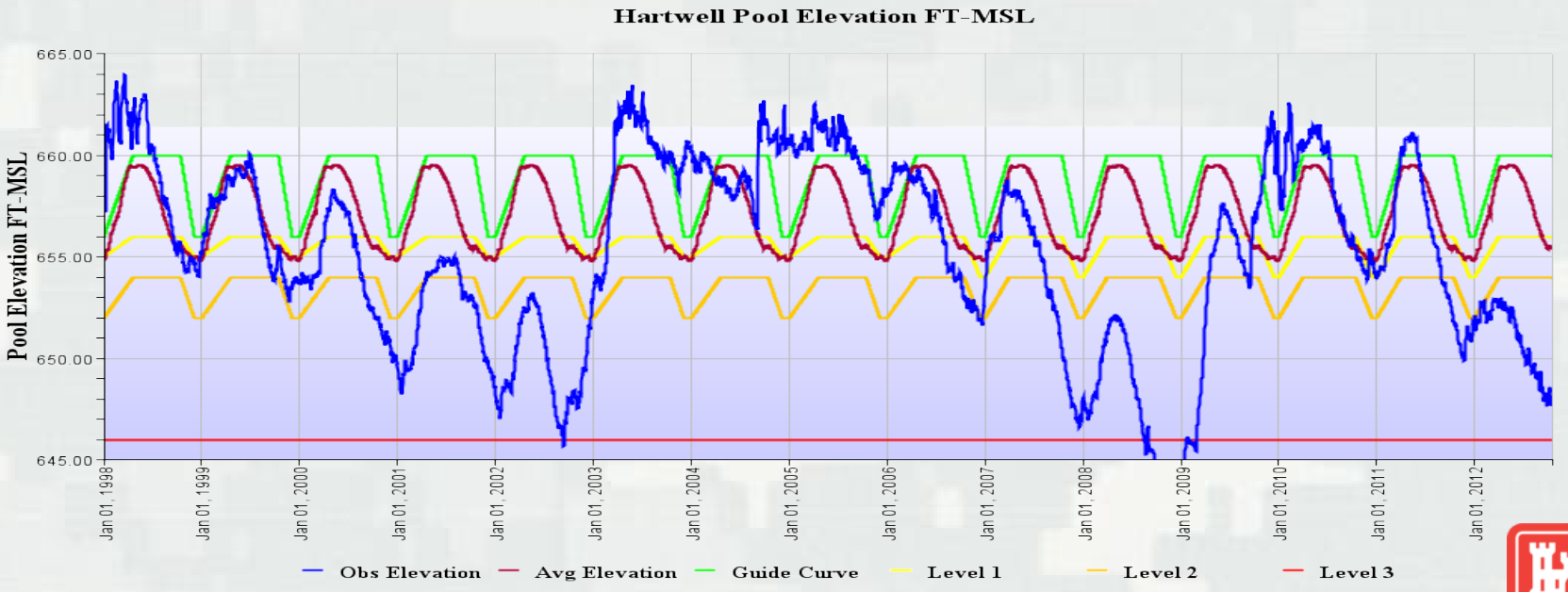
Collaborative Process

- National Environmental Policy Act (NEPA)
- Clean Water Act (CWA)
- Endangered Species Act (ESA)



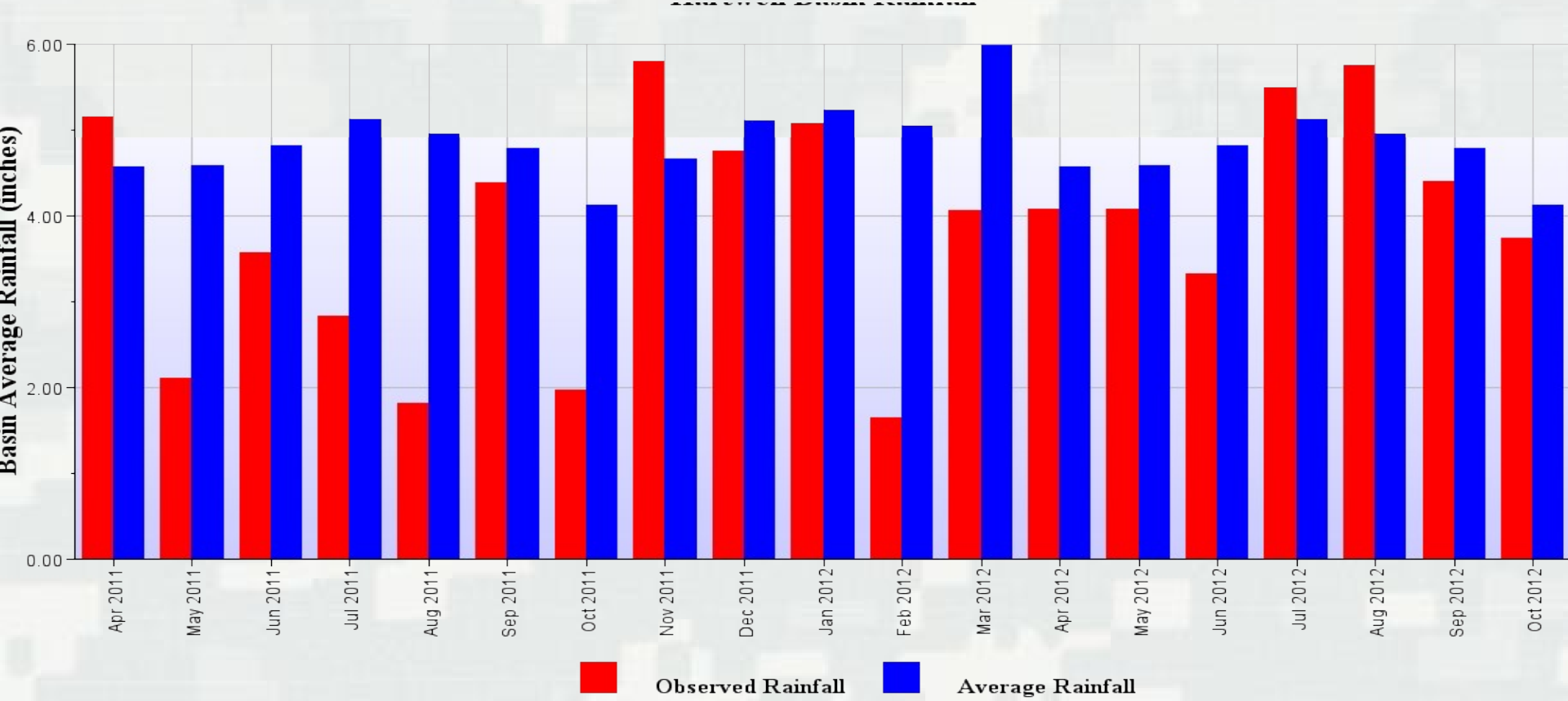
Long-term & Sustained Drought

1997-2002 rainfall	2002-2007 rainfall	2007-2012 rainfall
Deficit	**Deficit**	**Deficit**
Hartwell -29.93	Hartwell -19.63	Hartwell -32.94
Thurmond -21.63	Thurmond -4.42	Thurmond -12.41



KavaChart images from VE.com

Hartwell Rainfall

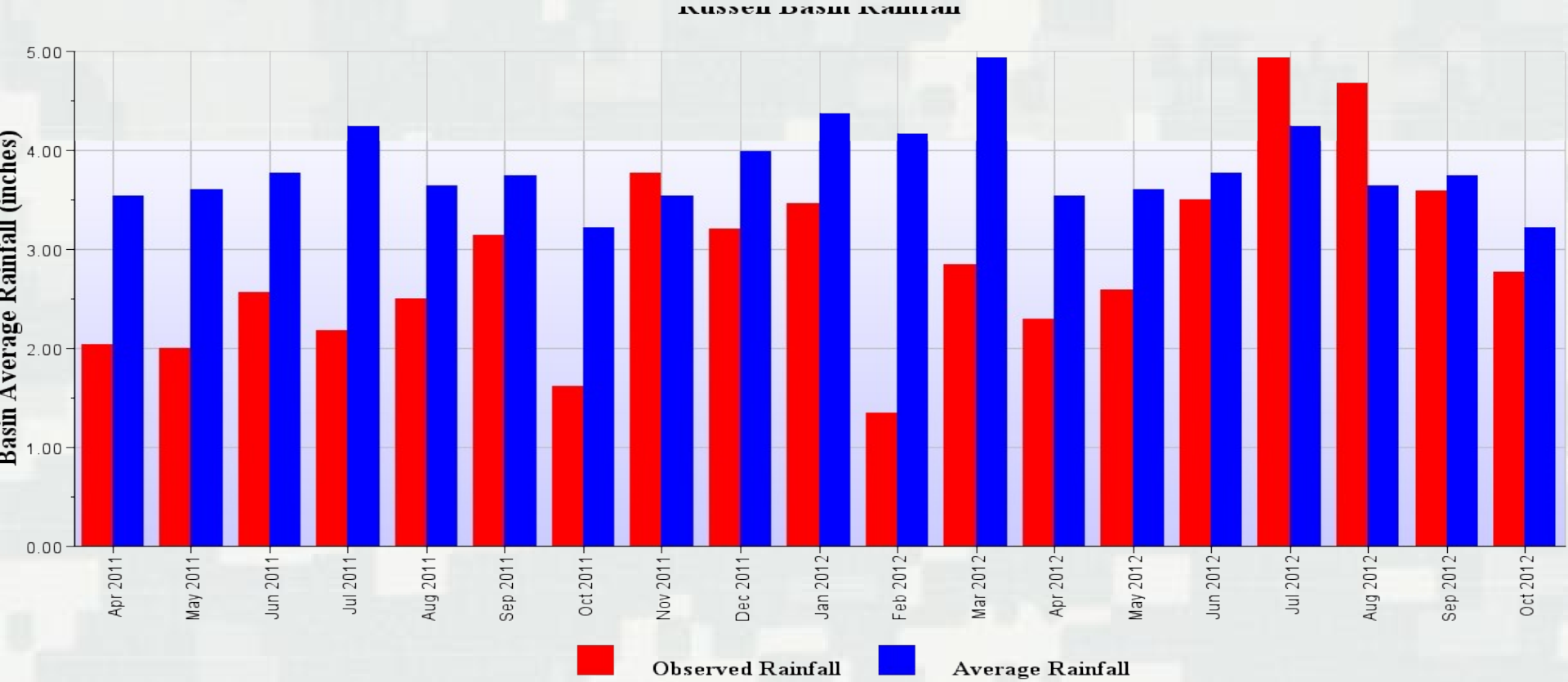


mages from VE.com

Sum Observed Rainfall= 74.2 " Sum Avg Monthly Rainfall= 94.5 " 20.3 inch Rainfall Deficit
01 Apr 2011 - 09 Oct 2012

74.2 **94.5** **20.3**

Russell Rainfall

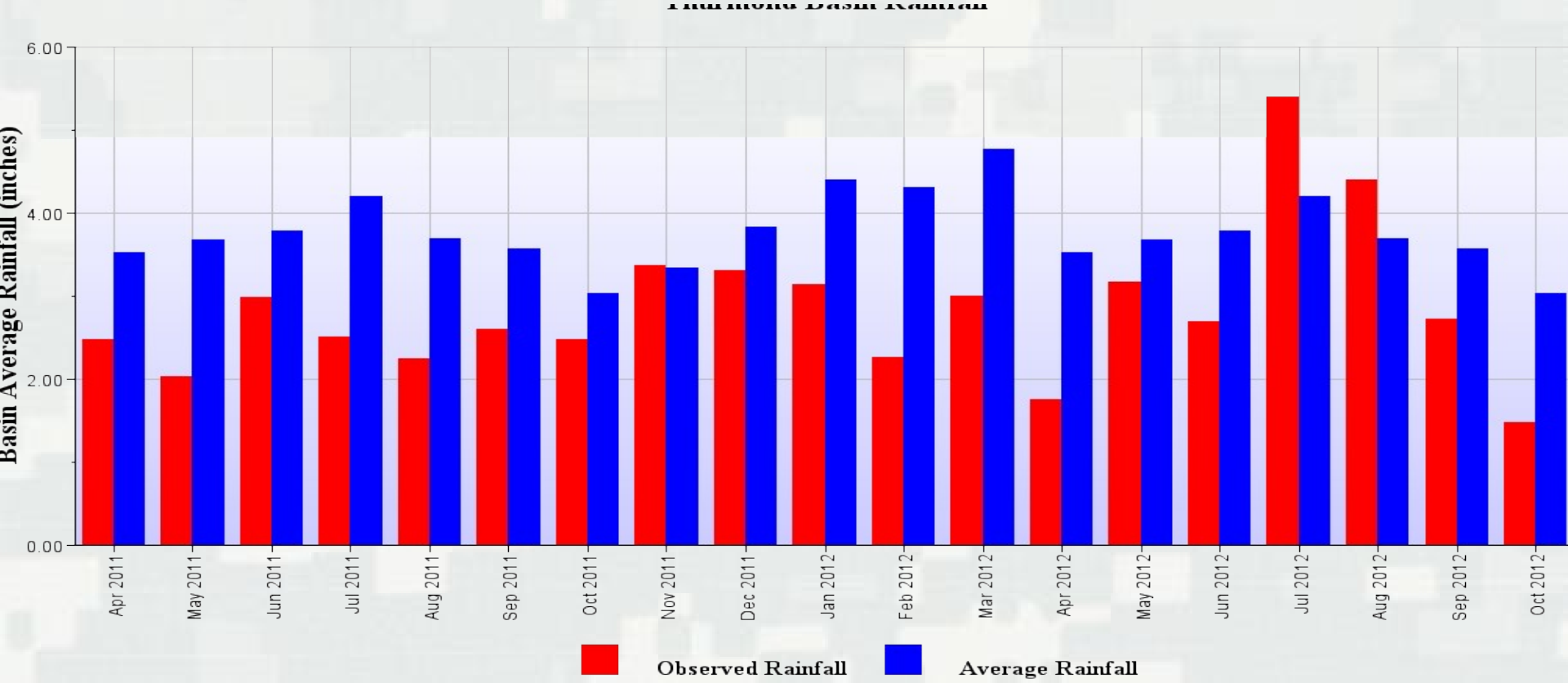


nages from VE.com

Sum Observed Rainfall= 55.1 " Sum Avg Monthly Rainfall= 75.5 " 20.3 inch Rainfall Deficit
01 Apr 2011 - 09 Oct 2012

55.1 **75.5** **20.3**

Thurmond Rainfall

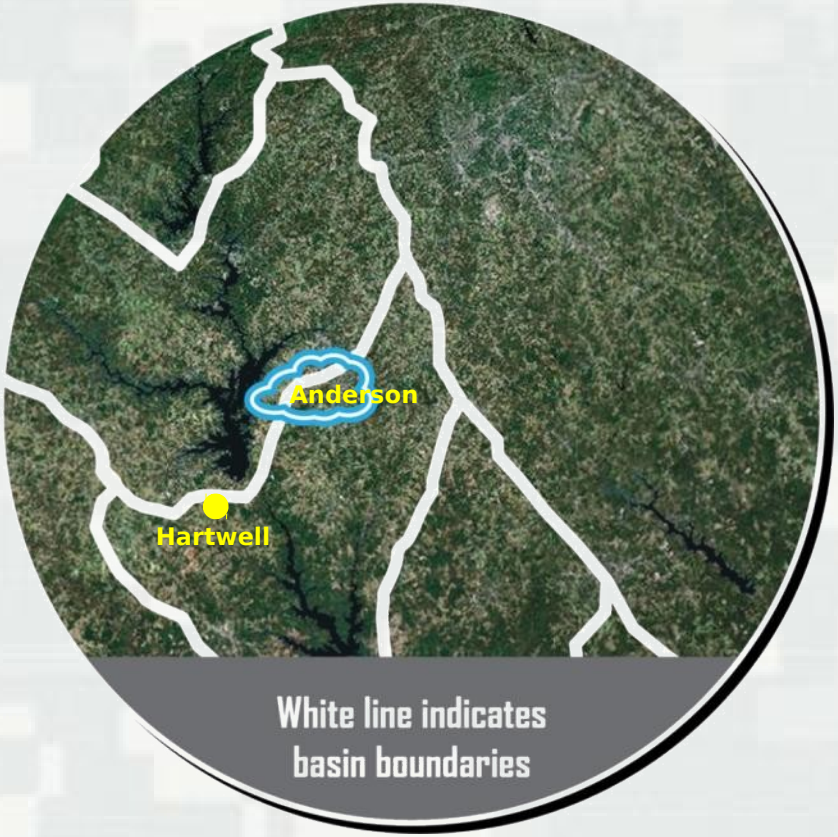


nages from VE.com

Sum Observed Rainfall= 54.1 " Sum Avg Monthly Rainfall= 74.9 " 20.7 inch Rainfall Deficit
01 Apr 2011 - 09 Oct 2012

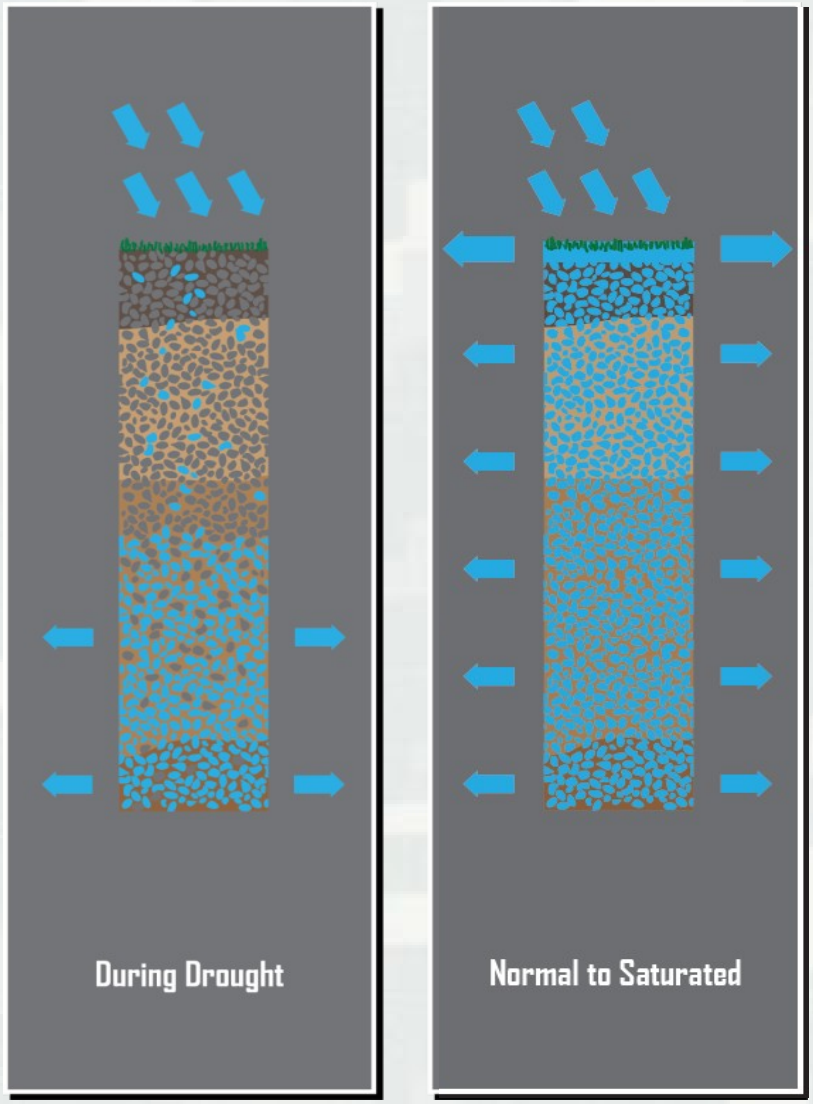
54.1 **74.9** **20.8**

Why Aren’t the Lake Levels Rising?



Why Aren’t the Lake Levels Rising?

Ground soaks up rainfall; no run off



Produces Run off

Drainage Basins

- Hartwell = 1186 Square Miles (Local Basin Area)
  1” Runoff = 1.1’ pool elevation @ 660.0
- Russell = 802 Square Miles (Local Basin Area)
  1” Runoff = 1.5’ pool elevation @ 475.0
- Thurmond = 3254 Square Miles (Local Basin Area)
  1” Runoff = 2.5’ pool elevation @ 330.0

Typically it would have to rain between 2 and 6 inches in order to develop 1 inch of runoff depending on conditions

Drought Plan History

Event	Action	Description
1986-1989 Drought (New Drought of Record)	1989 Drought Contingency Plan	Introduced flow restrictions Level 1 – Safety Advisory for boaters Level 2- Max weekly average 4500 cfs Level 3- Specified 3600 cfs daily average at Thurmond
1998-2002 Drought (New Drought of Record)	2006 Drought Plan Update Environmental Assessment - (Step 1 Savannah River Basin Comprehensive Study)	Level 1 – Max weekly average 4200 cfs Level 2- Max weekly average 4000 cfs Level 3- Specified 3800 cfs daily average at Thurmond
2007-2009 Drought (New Drought of Record)	Temporary deviation to 3600cfs at Thurmond Oct2007-May2009 (supported by Federal and State agencies without an EA)	Reduction occurred at Drought Level 2 (Hartwell @ 649.85/ Thurmond@319.76)
	Temporary Deviation to 3100cfs Dec2008-Jan2009 (supported by Federal and State agencies without an EA)	Used adaptive management to maintain 3600 min @ Savannah River at Augusta gage
	Drought Level 4 Study and Environmental Assessment	Developed standard operating procedure for inactive storage (Level 4)
2011-? Drought	2012 Drought Plan Revision and Environmental Assessment	Evaluation and modification of the 2006 EA rules in the 2007-2009 drought and temporary deviations

- ✓ **Will refill lake above winter drawdown to full pool**
- ✓ **Seeking resource agency concurrence to hold 3,800 cfs during refill**

2012 Drought Plan

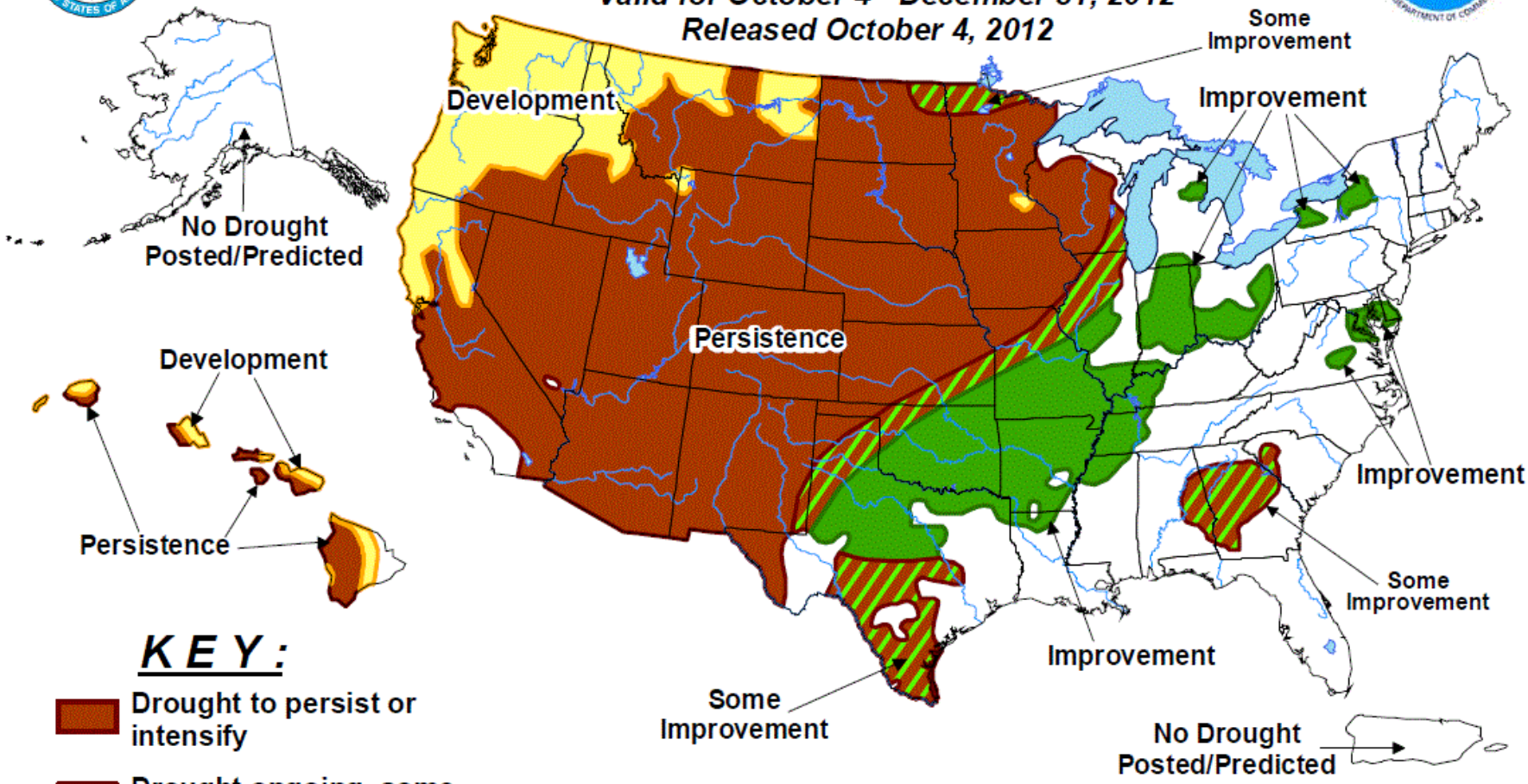
Trigger Level	Time of Year	Drought Response
1	Jan 1 - Dec 31	IF BR index >10%, Target 4200 cfs (daily average) release at Thurmond Dam IF BR index <10%, Target 4000 cfs (daily average) release at Thurmond Dam
2	Feb 1 - Oct 31	IF BR index >10%, Target 4000 cfs (daily average) release at Thurmond Dam IF BR index <10%, Target 3800 cfs (daily average) release at Thurmond Dam
	Nov 1 - Jan 31	Target 3600 cfs (daily average) release at Thurmond Dam
3	Feb 1 - Oct 31	Target 3800 cfs (daily average) release at Thurmond Dam
	Nov 1 - Jan 31 (Feb 1 – Feb 28 w/NMFS approval)	Target 3100 cfs (daily average) release at Thurmond Dam
4	Feb 1 - Oct 31	Target 3600 cfs (daily average) release at Thurmond Dam
	Nov 1 - Jan 31 (Feb 1 – Feb 28 w/NMFS approval)	Target 3100 cfs (daily average) release at Thurmond Dam

U.S. Seasonal Drought Outlook

Drought Tendency During the Valid Period

Valid for October 4 - December 31, 2012

Released October 4, 2012



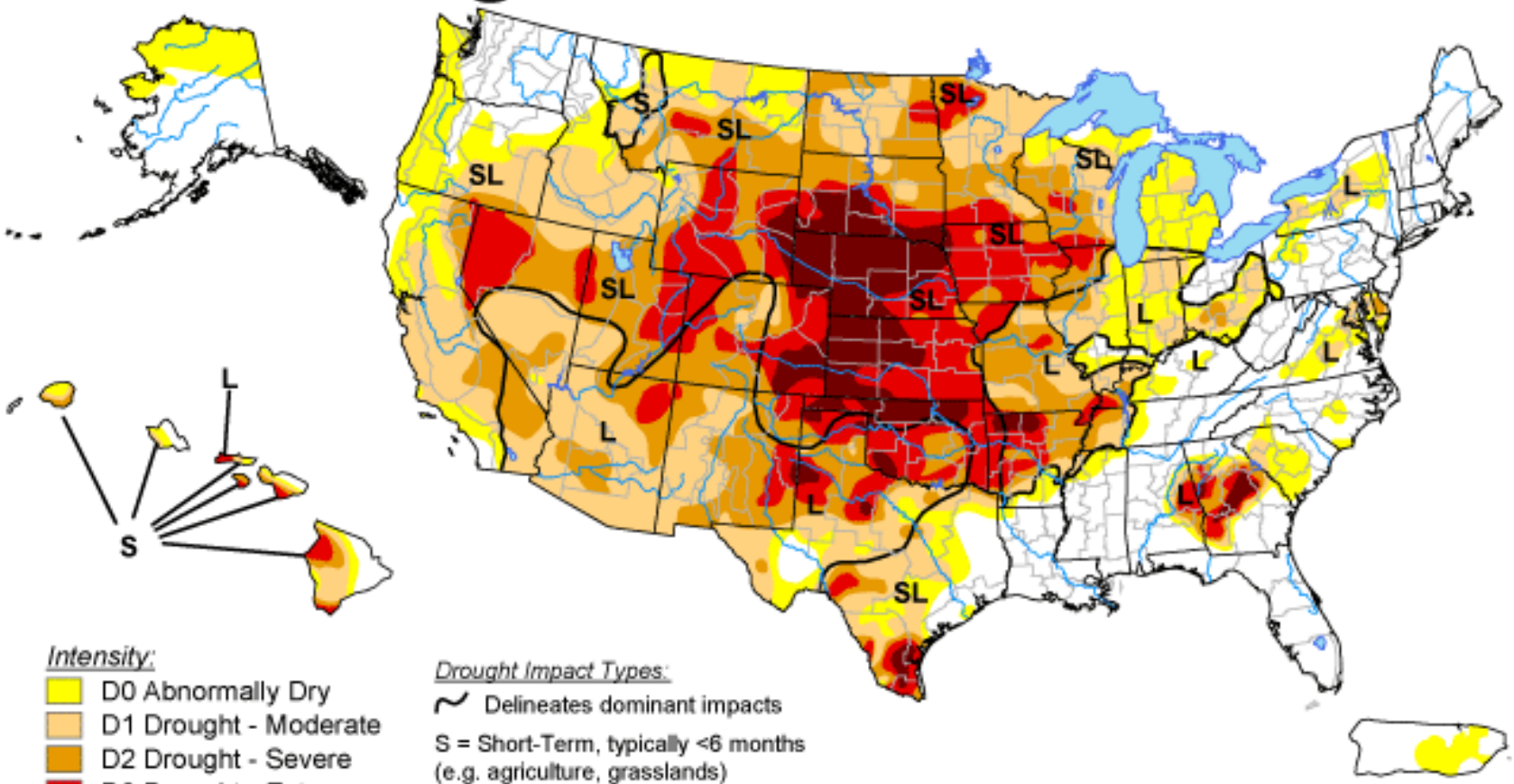
KEY:

- Drought to persist or intensify
- Drought ongoing, some improvement
- Drought likely to improve, impacts ease
- Drought development likely

Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Short-term events -- such as individual storms -- cannot be accurately forecast more than a few days in advance. Use caution for applications -- such as crops -- that can be affected by such events. "Ongoing" drought areas are approximated from the Drought Monitor (D1 to D4 intensity). For weekly drought updates, see the latest U.S. Drought Monitor. NOTE: the green improvement areas imply at least a 1-category improvement in the Drought Monitor intensity levels, but do not necessarily imply drought elimination.

U.S. Drought Monitor

October 9, 2012
Valid 7 a.m. EDT



Intensity:
- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

Drought Impact Types:

Delineates dominant impacts

S = Short-Term, typically <6 months
(e.g. agriculture, grasslands)

L = Long-Term, typically >6 months
(e.g. hydrology, ecology)

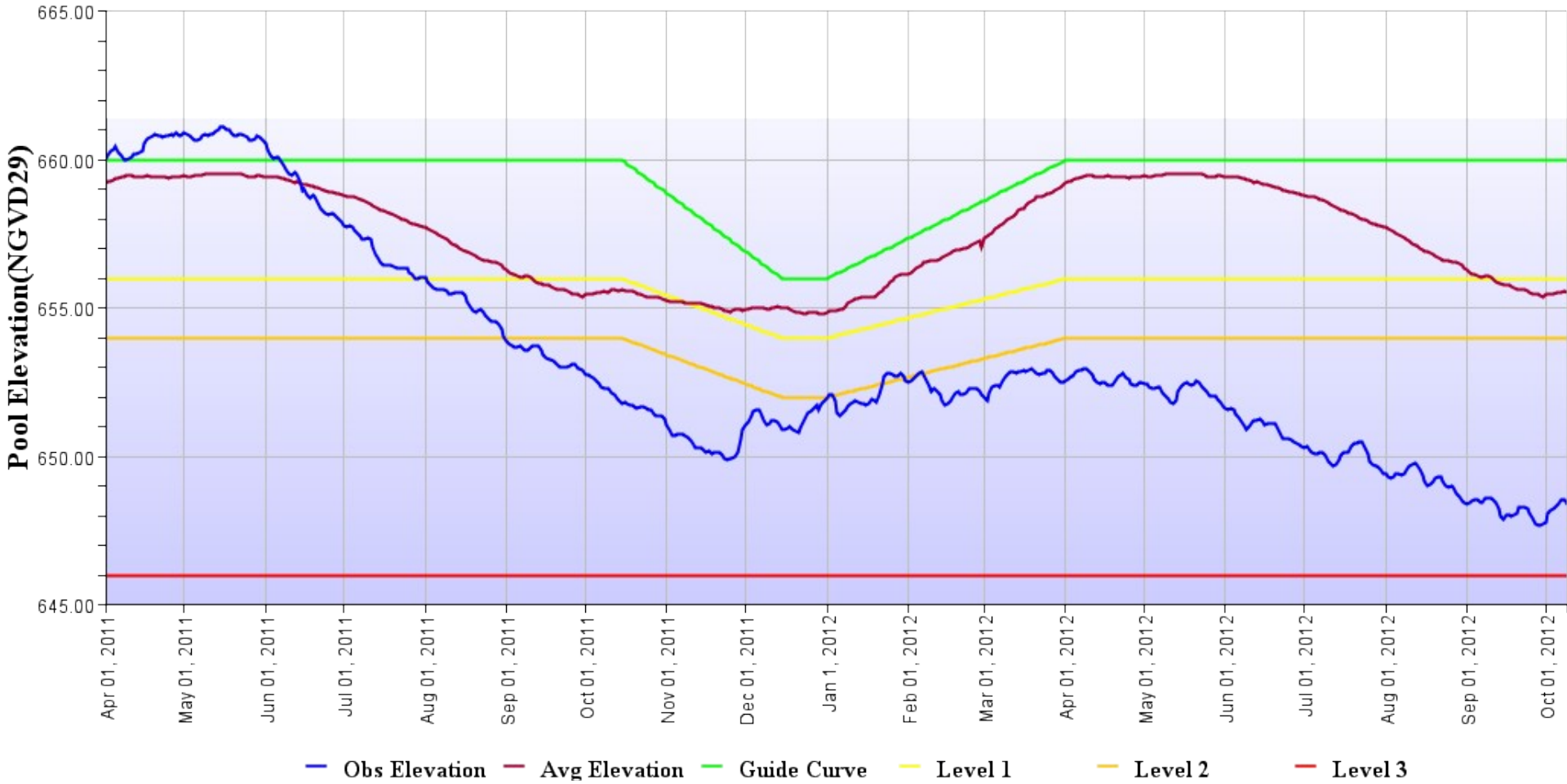
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

http://droughtmonitor.unl.edu/

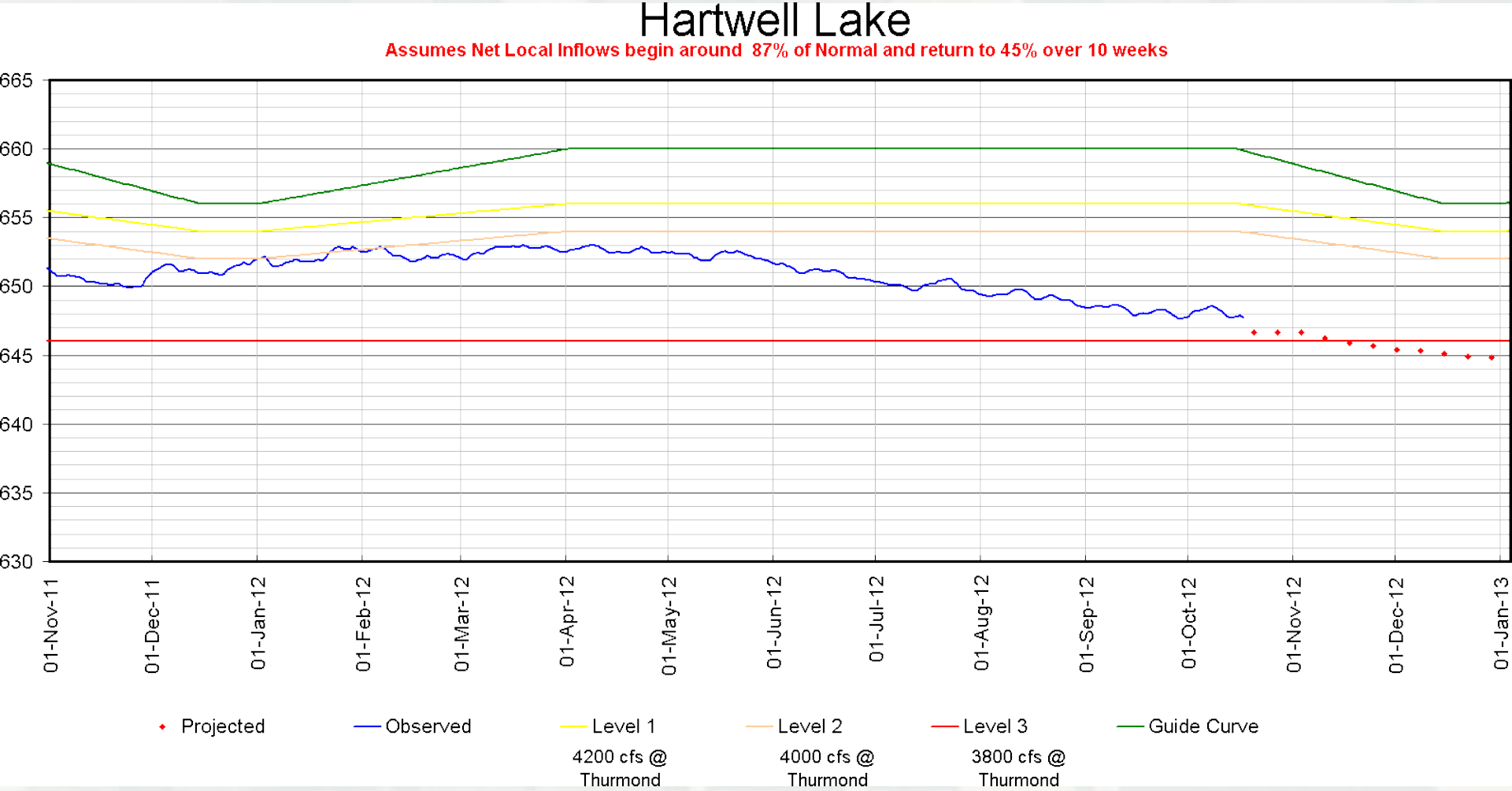
Released Thursday, October 11, 2012

Author: Matthew Rosencrans, NOAA/NWS/NCEP/CPC

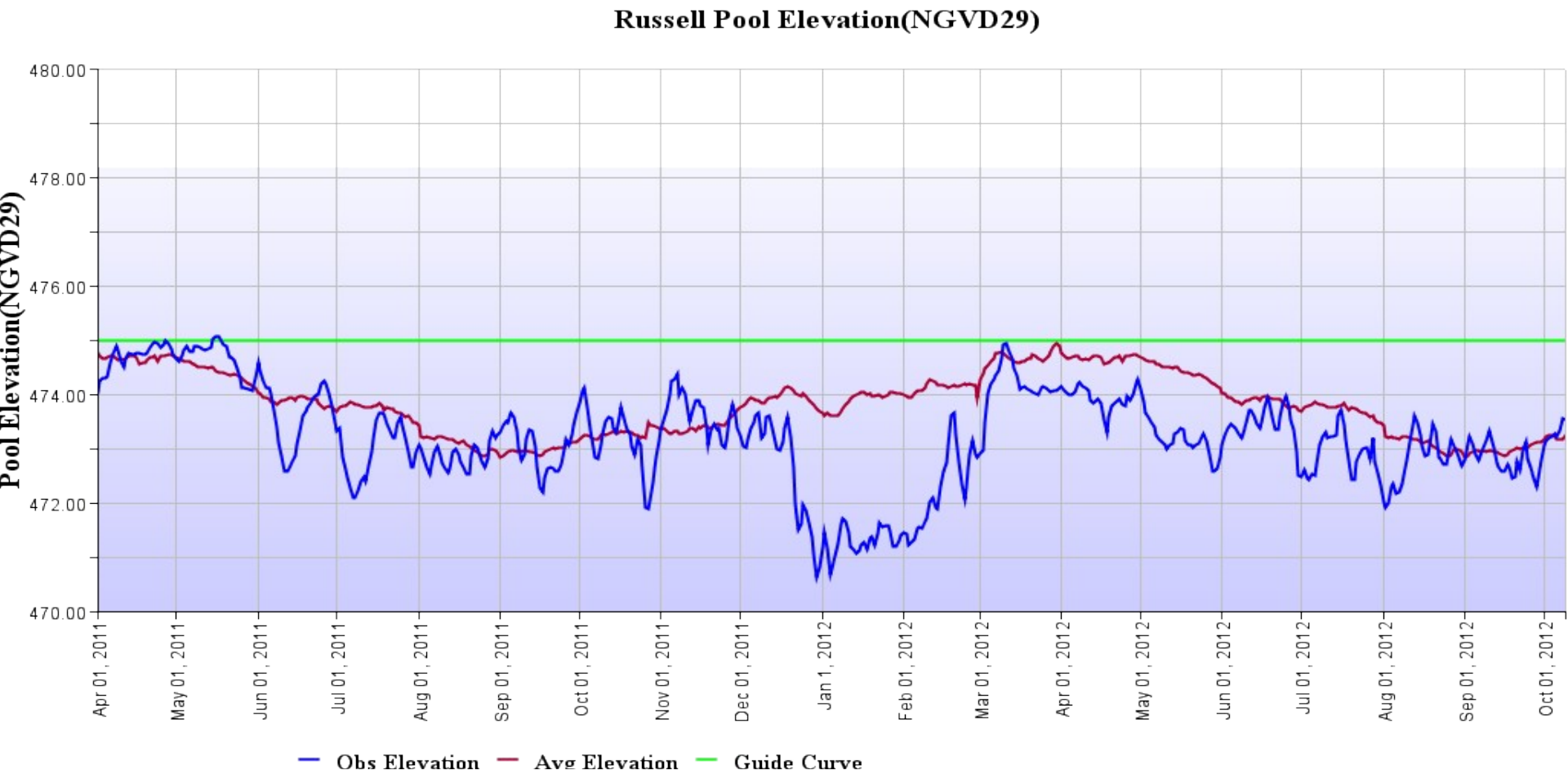
Hartwell Pool Elevation



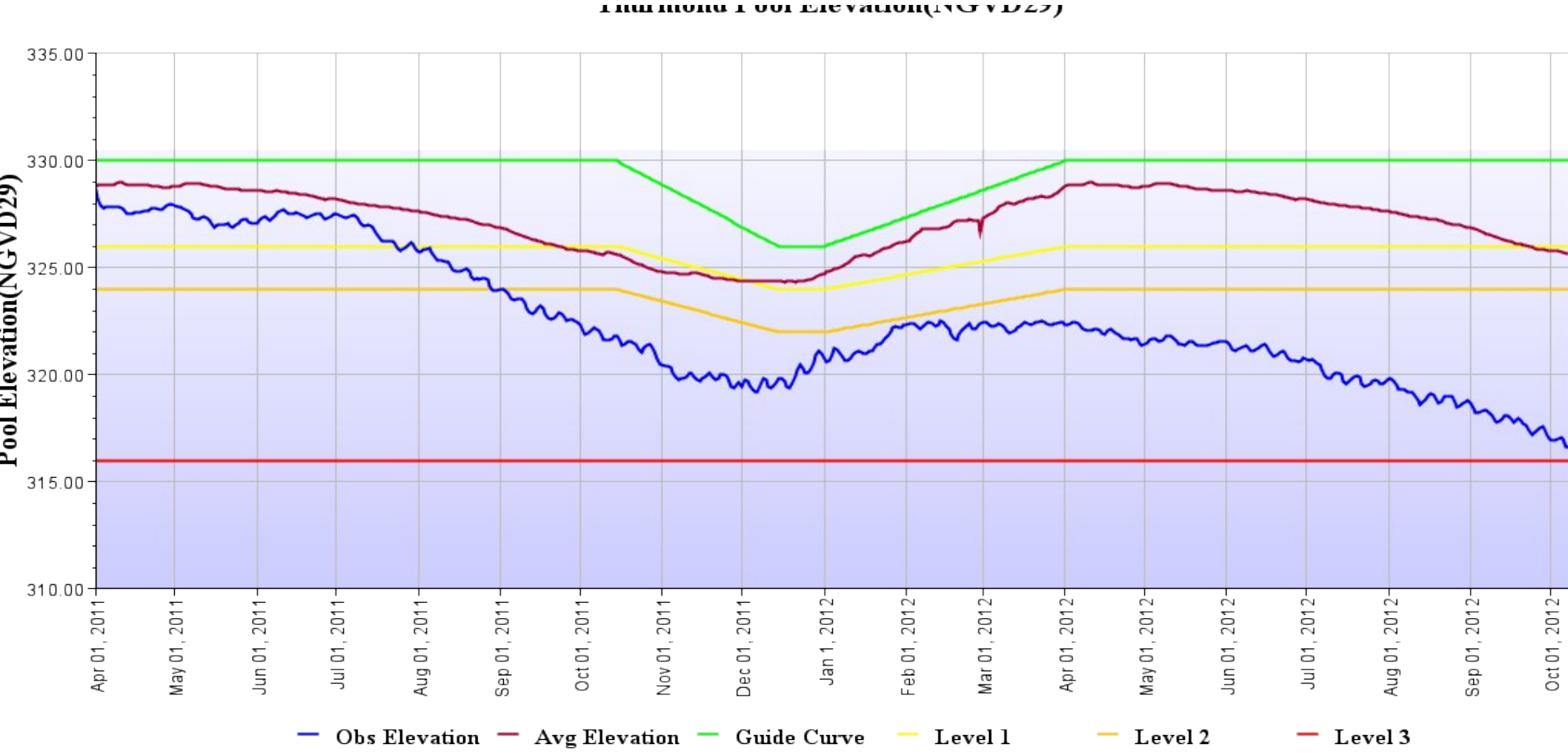
10 Week Projection



Russell Pool Elevation



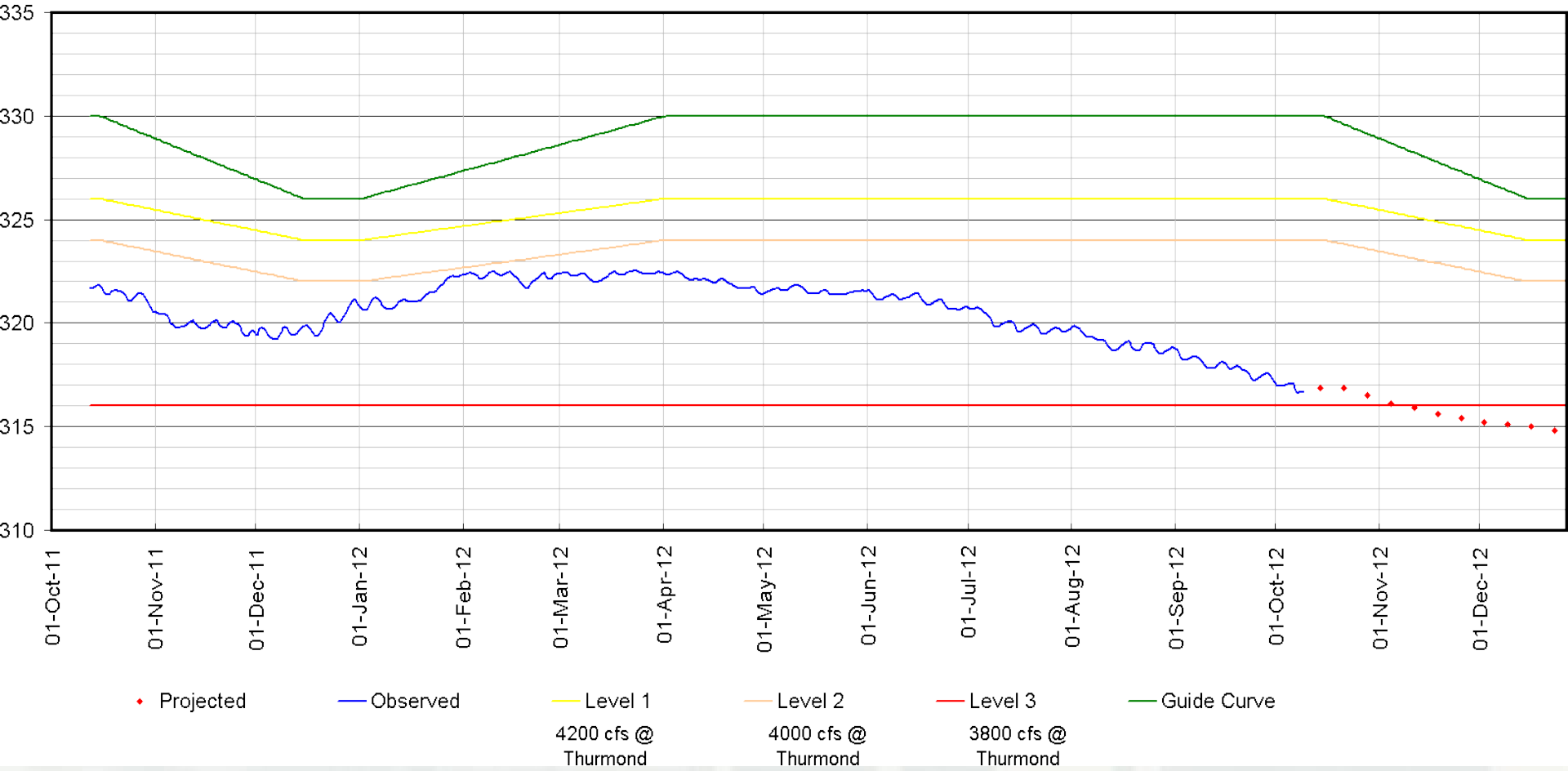
Thurmond Pool Elevation



10 Week Projection

Thurmond Lake

Assumes Net Local Inflows begin around 9% of Normal and return to 40% over 10 weeks



Savannah River Basin Comprehensive Study

- **Purpose:** Assess the current needs in the basin during flood, normal and drought conditions to determine whether operational changes are warranted.

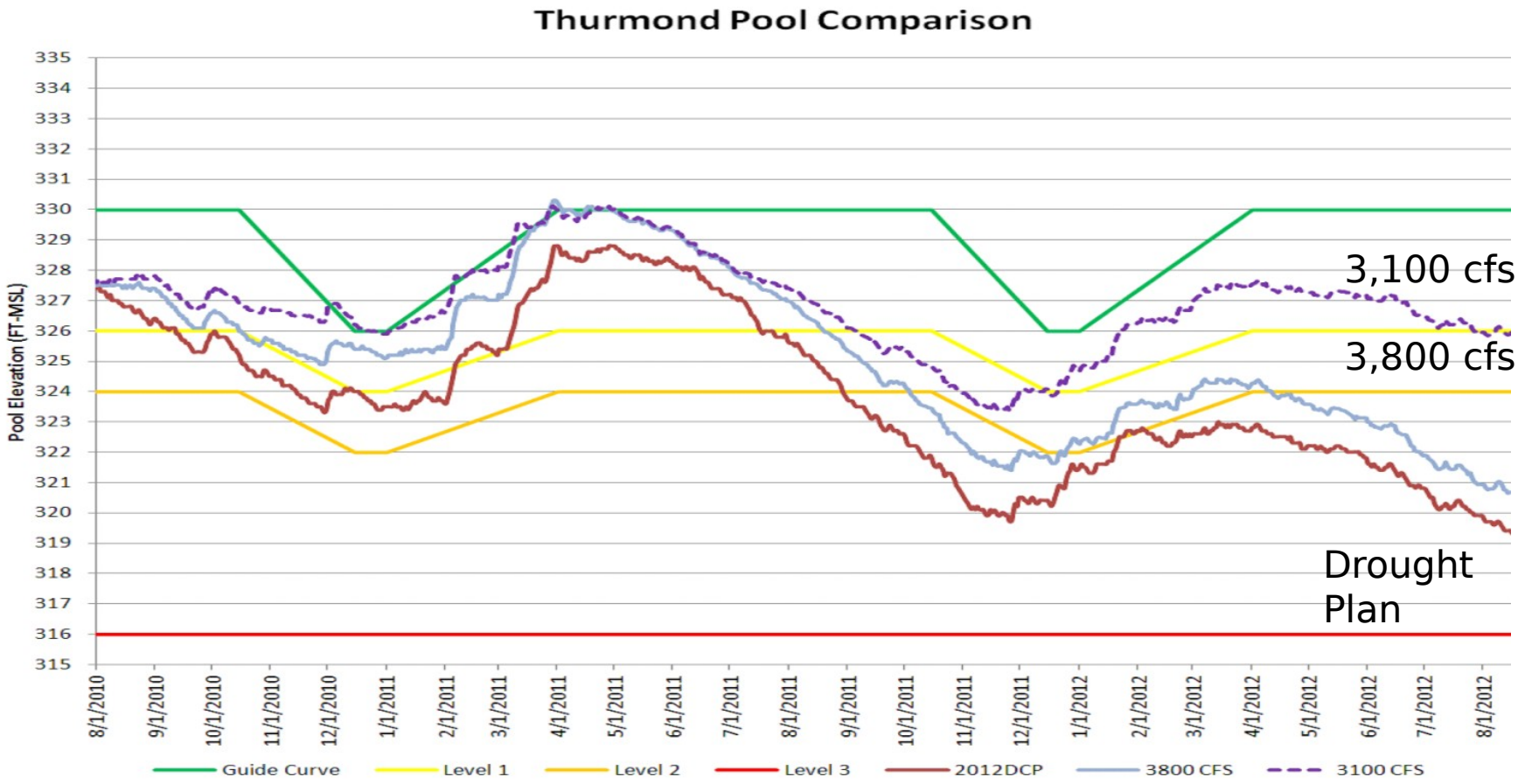
- **Study Components:**
  - Interim Study I: Completed in 2006 with an Environmental Assessment and operational changes to the Comprehensive Study.
  - Interim Study II: Drought Contingency Plan Update and determine the minimum acceptable flow during droughts.
  - Future Interim Studies: Hydrologic Engineering and Environmental Analyses.

- **Study Sponsorship:**
  - Study Cost: Interim Study I: $1.8M, Interim Study II: $908K, Interim Study III: TBD
  - Cost Share: 50% Federal/ 50% Non-Federal (cash or work-in-kind services)
  - Non-Federal Sponsors: GA-DNR, SC-DNR (and The Nature Conservancy)

- **Estimated Completion Date:** 2027 (Interim Study II: 2014)

July 2012 Congressional Request

Desires pool levels to remain no greater than 7-8 feet down. Releases would have to be 3,100 cfs when 2’ below full pool to meet this requirement during the current drought period. A 3,100cfs constant release is unacceptable to State and Federal resource agencies. (3,600cfs is the current minimum permitting standard)



Savannah River Basin Comprehensive Study Alternatives

Level	NAA	Alt 1	Alt2	Alt 3	Alt4	Alt 5
1	4200 >10% Qin 4000 <=10% Qin	3800 Feb-Apr 3500 May-Jan	4000 at 326	Drought Ecosystem Flow Prescription	3600 3100 Nov-Jan	
2	4000 >10% Qin 3800 <=10% Qin 3600 Nov-Jan	2800 Feb-Apr 2500 May-Jan	3800 at 324 3600 Nov-Jan	Drought Ecosystem Flow Prescription	3600 3100 Nov-Jan	TO BE DETERMINED
3	3800 3100 Nov-Jan	1800 Feb-Apr 1500 May-Jan	3600 at 322 3100 Nov-Jan	Drought Ecosystem Flow Prescription	3600 3100 Nov-Jan	
4	3600 3100 Nov-Jan	1800Feb-Apr 1500 May-Jan	3600 3100 Nov-Jan	3600 3100 Nov-Jan	3600 3100 Nov-Jan	

10% Qin is defined as the 10th percentile flow at the Broad River near Bell piedmont reference stream gage for reservoir inflow. Holding minimum drought release until pools have recovered to guide curve will be evaluated on chosen Alternative

Questions?